

What is claimed is:

1. An internal member of a plasma processing vessel, comprising:

5 a base material; and

a film formed by thermal spraying of ceramic on a surface of the base material,

wherein the film is formed of ceramic including at least one kind of element selected from the group consisting

10 of B, Mg, Al, Si, Ca, Cr, Y, Zr, Ta, Ce and Nd, and at least a portion of the film is sealed by a resin.

2. An internal member of a plasma processing vessel, comprising:

15 a base material; and

a film formed by thermal spraying of ceramic on a surface of the base material,

wherein the film has a first ceramic layer formed of ceramic including at least one kind of element selected from

20 the group consisting of B, Mg, Al, Si, Ca, Cr, Y, Zr, Ta, Ce and Nd and a second ceramic layer formed of ceramic including at least one kind of element selected from the group consisting of B, Mg, Al, Si, Ca, Cr, Y, Zr, Ta, Ce and Nd, and at least a portion of at least one of the first and 25 the second ceramic layer is sealed by a resin.

3. The internal member of claim 1, wherein the resin is selected from the group consisting of SI, PTFE, PI, PAI, PEI, PBI and PFA.

5 4. The internal member of claim 1, wherein the ceramic is at least one kind of ceramic selected from the group consisting of B<sub>4</sub>C, MgO, Al<sub>2</sub>O<sub>3</sub>, SiC, Si<sub>3</sub>N<sub>4</sub>, SiO<sub>2</sub>, CaF<sub>2</sub>, Cr<sub>2</sub>O<sub>3</sub>, Y<sub>2</sub>O<sub>3</sub>, YF<sub>3</sub>, ZrO<sub>2</sub>, TaO<sub>2</sub>, CeO<sub>2</sub>, Ce<sub>2</sub>O<sub>3</sub>, CeF<sub>3</sub> and Nd<sub>2</sub>O<sub>3</sub>.

10 5. An internal member of a plasma processing vessel, comprising:

a base material; and

a film formed by thermal spraying of ceramic on a surface of the base material,

15 wherein the film is formed of ceramic including at least one kind of element selected from the group consisting of B, Mg, Al, Si, Ca, Cr, Y, Zr, Ta, Ce and Nd, and at least a portion of the film is sealed by a sol-gel method.

20 6. An internal member of a plasma processing vessel, comprising:

a base material; and

a film formed by thermal spraying of ceramic on a surface of the base material,

25 wherein the film has a first ceramic layer formed of ceramic including at least one kind of element selected from

the group consisting of B, Mg, Al, Si, Ca, Cr, Y, Zr, Ta, Ce and Nd and a second ceramic layer formed of ceramic including at least one kind of element selected from the group consisting of B, Mg, Al, Si, Ca, Cr, Y, Zr, Ta, Ce and Nd, and at least a portion of at least one of the first and the second ceramic layer is sealed by a sol-gel method.

7. The internal member of claim 5, wherein the sealing treatment is executed by using an element of the Group 3A in 10 the periodic table.

8. The internal member of claim 5, wherein the ceramic is at least one kind of ceramic selected from the group consisting of B<sub>4</sub>C, MgO, Al<sub>2</sub>O<sub>3</sub>, SiC, Si<sub>3</sub>N<sub>4</sub>, SiO<sub>2</sub>, CaF<sub>2</sub>, Cr<sub>2</sub>O<sub>3</sub>, 15 Y<sub>2</sub>O<sub>3</sub>, YF<sub>3</sub>, ZrO<sub>2</sub>, TaO<sub>2</sub>, CeO<sub>2</sub>, Ce<sub>2</sub>O<sub>3</sub>, CeF<sub>3</sub> and Nd<sub>2</sub>O<sub>3</sub>.

9. An internal member of a plasma processing vessel, comprising:

20 a base material; and  
a film formed on a surface of the base material,  
wherein the film has a main layer formed by thermal spraying of ceramic and a barrier coat layer formed of ceramic including an element selected from the group consisting of B, Mg, Al, Si, Ca, Cr, Y, Zr, Ta, Ce and Nd.

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10. The internal member of claim 9, wherein the barrier

coat layer is formed of at least one kind of ceramic selected from the group consisting of  $B_4C$ ,  $MgO$ ,  $Al_2O_3$ ,  $SiC$ ,  $Si_3N_4$ ,  $SiO_2$ ,  $CaF_2$ ,  $Cr_2O_3$ ,  $Y_2O_3$ ,  $YF_3$ ,  $ZrO_2$ ,  $TaO_2$ ,  $CeO_2$ ,  $Ce_2O_3$ ,  $CeF_3$  and  $Nd_2O_3$ .

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11. The internal member of claim 9, wherein the barrier coat layer is a thermally sprayed film at least a portion of which is sealed by a resin.

10 12. The internal member of claim 11, wherein the resin is selected from the group consisting of SI, PTFE, PI, PAI, PEI, PBI and PFA.

15 13. The internal member of claim 9, wherein the barrier coat layer is a thermally sprayed film at least a portion of which is sealed by a sol-gel method.

20 14. The internal member of claim 13, wherein the sealing treatment is executed by using an element of the Group 3a in the periodic table.

25 15. The internal member of claim 9, wherein the main layer is formed of at least one kind of ceramic selected from the group consisting of  $B_4C$ ,  $MgO$ ,  $Al_2O_3$ ,  $SiC$ ,  $Si_3N_4$ ,  $SiO_2$ ,  $CaF_2$ ,  $Cr_2O_3$ ,  $Y_2O_3$ ,  $YF_3$ ,  $ZrO_2$ ,  $TaO_2$ ,  $CeO_2$ ,  $Ce_2O_3$ ,  $CeF_3$  and  $Nd_2O_3$ .

16. An internal member of a plasma processing vessel, comprising:

a base material; and

a film formed on a surface of the base material,

5 wherein the film has a main layer formed by thermal spraying of ceramic and a barrier coat layer formed of engineering plastic formed between the base material and the main layer.

10 17. The internal member of claim 16, wherein the engineering plastic is selected from the group consisting of PTFE, PI, PAI, PEI, PBI, PFA, PPS and POM.

15 18. The internal member of claim 16, wherein the main layer is formed of at least one kind of ceramic selected from the group consisting of  $B_4C$ ,  $MgO$ ,  $Al_2O_3$ ,  $SiC$ ,  $Si_3N_4$ ,  $SiO_2$ ,  $CaF_2$ ,  $Cr_2O_3$ ,  $Y_2O_3$ ,  $YF_3$ ,  $ZrO_2$ ,  $TaO_2$ ,  $CeO_2$ ,  $Ce_2O_3$ ,  $CeF_3$  and  $Nd_2O_3$ .

19. An internal member of a plasma processing vessel, 20 comprising:

a base material; and

a film formed on a surface of the base material,

25 wherein the film is formed of ceramic including at least one kind of element of the Group 3a in the periodic table and at least a portion of the film is hydrated by vapor or high temperature hot water.

20. An internal member of a plasma processing vessel, comprising:

a base material; and

5 a film formed on a surface of the base material,

wherein the film has a first ceramic layer formed of ceramic including at least one kind of element of the Group 3a in the periodic table and a second ceramic layer made of ceramic including at least one kind of element of the Group 10 3a in the periodic table, and at least a portion of at least one of the first and the second ceramic layer is hydrated by vapor or high temperature hot water.

21. The internal member of claim 19, wherein the film is a 15 thermally sprayed film formed by thermal spraying or a thin film formed by employing a technique for forming a thin film.

22. The internal member of claim 19, wherein the film is formed of ceramic selected from  $Y_2O_3$ ,  $CeO_2$ ,  $Ce_2O_3$  and  $Nd_2O_3$ .

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23. An internal member of a plasma processing vessel, comprising:

a base material; and

a film formed on a surface of the base material,

25 wherein the film has a first ceramic layer formed of ceramic including at least one kind of element of the Group

3a in the periodic table and a second ceramic layer formed by thermal spraying of ceramic, and at least a portion of the first ceramic layer is hydrated by vapor or high temperature hot water.

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24. The internal member of claim 23, wherein the first ceramic layer is a thermally sprayed film formed by thermal spraying or a thin film formed by employing a technique for forming a thin-film.

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25. The internal member of claim 23, wherein the first ceramic layer is formed of ceramic selected from  $Y_2O_3$ ,  $CeO_2$ ,  $Ce_2O_3$  and  $Nd_2O_3$ .

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26. The internal member of claim 23, wherein the second ceramic layer is formed of at least one kind of ceramic selected from the group consisting of  $B_4C$ ,  $MgO$ ,  $Al_2O_3$ ,  $SiC$ ,  $Si_3N_4$ ,  $SiO_2$ ,  $CaF_2$ ,  $Cr_2O_3$ ,  $Y_2O_3$ ,  $YF_3$ ,  $ZrO_2$ ,  $TaO_2$ ,  $CeO_2$ ,  $Ce_2O_3$ ,  $CeF_3$  and  $Nd_2O_3$ .

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27. An internal member of a plasma processing vessel, comprising:

a base material; and

a film formed on a surface of the base material,

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wherein the film has a hydroxide layer formed of hydroxide including at least one kind of element of the

Group 3a in the periodic table.

28. The internal member of claim 27, wherein the hydroxide layer is a thermally sprayed film formed by thermal spraying  
5 or a thin film formed by employing a technique for forming a thin film.

29. The internal member of claim 27, wherein the hydroxide forming the hydroxide layer is formed of hydroxide selected  
10 from  $\text{Y(OH)}_3$ ,  $\text{Ce(OH)}_3$  and  $\text{Nd(OH)}_3$ .

30. The internal member of claim 27, wherein at least a portion of the hydroxide layer is sealed.

15 31. The internal member of any one of claims 1, 5, 9, 16, 19, 23 and 27, wherein an anodic oxidized film is formed between the base material and the film.

20 32. The internal member of claim 31, wherein the anodic oxidized film is sealed by an aqueous solution of metal salt.

33. The internal member of claim 31, wherein the anodic oxidized film is sealed by a resin selected from the group consisting of SI, PTFE, PI, PAI, PEI, PBI and PFA.

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34. An internal member of a plasma processing vessel,

comprising:

a sintered ceramic body including at least one kind of element of the Group 3a in the periodic table,

5 wherein at least a portion of the sintered ceramic body is hydrated by vapor or high temperature hot water.

35. The internal member of claim 33, wherein the sintered ceramic body is formed by hydrating of ceramic selected from  $Y_2O_3$ ,  $CeO_2$ ,  $Ce_2O_3$  and  $Nd_2O_3$ .

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36. An internal member of a plasma processing vessel, comprising:

a sintered ceramic body including hydroxide including at least one kind of element of the Group 3a in the periodic table.

15 37. The internal member of claim 36, wherein the sintered ceramic body includes hydroxide selected from  $Y(OH)_3$ ,  $Ce(OH)_3$  and  $Nd(OH)_3$ .

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